Biogeological Detection of Mars Analogs by Raman Spectroscopy

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Raman spectroscopy is an analytical technique under consideration as part of an instrumentation suite on robotic landers for the exploration of planetary surfaces and in particular for Mars . The possibilities of Raman spectroscopy to obtain good analytical results for both organic and inorganic compounds with little or no sample preparation and the determination of molecular structural information from either macro or micro samples makes this technique a valuable contender for the detection of chemical traces of life, particularly in hostile environments.

In recent years , the study of different survival strategies developed by extremophile organisms on Earth, which includes the production of protective pigments, mineral transformation and the mobilisation of some inorganic phases, has been the focus for novel analytical instrumentation designed to locate and identify key biomolecules in the geological record.

In this work, we present the Raman spectroscopic study of different epilithic and endolithic organisms from extreme terrestrial habitats which are considered to be Martian analogs, including Arctic and Antarctic niche environments especially the organisms related to the "blueberry" type concretions. Our presentation will include the Raman spectroscopic identification of both bio- and geo-markers which will be of vital importance for the search of life on other planetary surfaces or subsurfaces. The conditions under which these key biochemicals are detected will behighlighted and the implications for analytical prospecting for signatures of life in planetary geology will be discussed.